US009160116B2

(12) **United States Patent**
Xiao et al.

(10) **Patent No.: US 9,160,116 B2**
(45) **Date of Patent: Oct. 13, 2015**

(54) **CONNECTOR AND ELECTRONIC DEVICE**

(71) Applicant: **Huawei Technologies Co., Ltd.**, Shenzhen, Guangdong (CN)

(72) Inventors: **Congtu Xiao**, Shenzhen (CN); **Zhigang Zhao**, Shenzhen (CN)

(73) Assignee: **Huawei Technologies Co., Ltd.**, Shenzhen (CN)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 79 days.

(21) Appl. No.: **14/034,142**

(22) Filed: **Sep. 23, 2013**

(65) **Prior Publication Data**

US 2014/0134879 A1 May 15, 2014

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2013/074270, filed on Apr. 16, 2013.

(30) **Foreign Application Priority Data**

Nov. 12, 2012 (CN) 2012 1 0450492

(51) **Int. Cl.**
H01R 24/64 (2011.01)
H01R 13/66 (2006.01)
H01R 12/73 (2011.01)

(52) **U.S. Cl.**
CPC ***H01R 13/665*** (2013.01); ***H01R 12/73*** (2013.01)

(58) **Field of Classification Search**
CPC H01R 24/64; H01R 13/665; H01R 24/40
USPC 439/620.15, 752
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,411,097	A *	11/1968	Hinrichs	330/9
4,882,554	A *	11/1989	Akaba et al.	333/105
6,409,547	B1 *	6/2002	Reede	439/676
6,932,649	B1	8/2005	Rothermel et al.	
7,517,236	B2 *	4/2009	Koyama	439/129
2004/0266224	A1 *	12/2004	Watson	439/66
2006/0216969	A1	9/2006	Bright et al.	
2011/0287633	A1	11/2011	Lee et al.	
2011/0287663	A1	11/2011	Gailus et al.	
2012/0028502	A1	2/2012	Yeh et al.	
2012/0094536	A1	4/2012	Khilchenko et al.	
2013/0288526	A1 *	10/2013	Rascon et al.	439/607.35
2013/0323974	A1 *	12/2013	Gutierrez et al.	439/620.15
2014/0307809	A1 *	10/2014	Lo	375/257

FOREIGN PATENT DOCUMENTS

CN	2842776 Y	11/2006
CN	1881699 A	12/2006

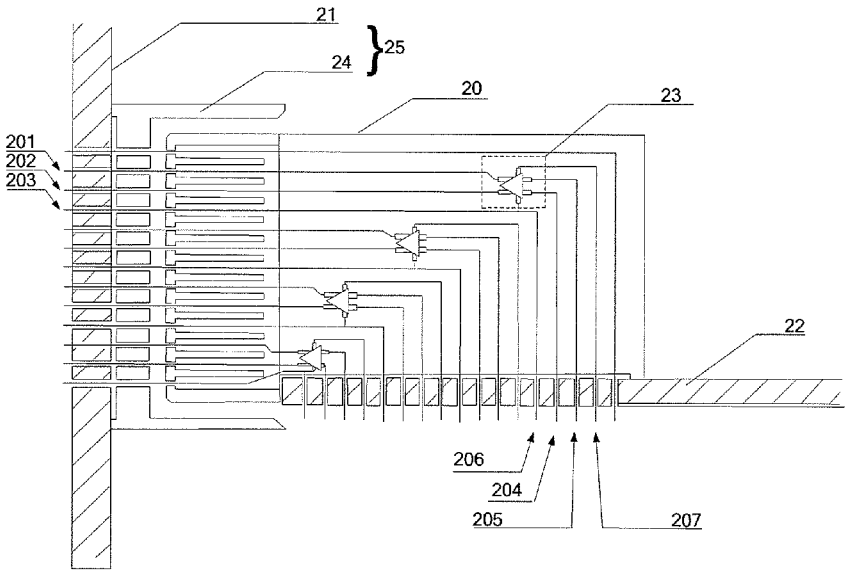
(Continued)

Primary Examiner — Truc Nguyen

(57) **ABSTRACT**

The present invention discloses a connector, including: a first interface, a second interface, and a signal boost circuit, where at least one of the first interface and the second interface includes a power supply contact head, and the power supply contact head is configured to power the signal boost circuit; and a casing, where the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, and the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing. Further, the present invention discloses an electronic device.

16 Claims, 15 Drawing Sheets



(56) **References Cited**

FOREIGN PATENT DOCUMENTS

CN	200979960	A	11/2007		
CN	201639126	U	11/2010		
CN	202454842	U	9/2012		
CN	102969624	A	3/2013		

* cited by examiner

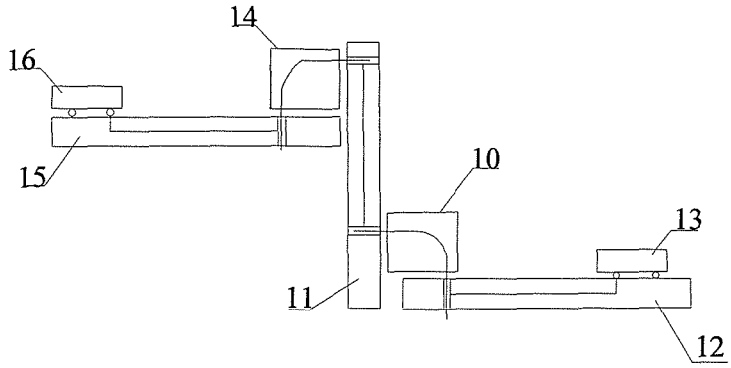


FIG. 1

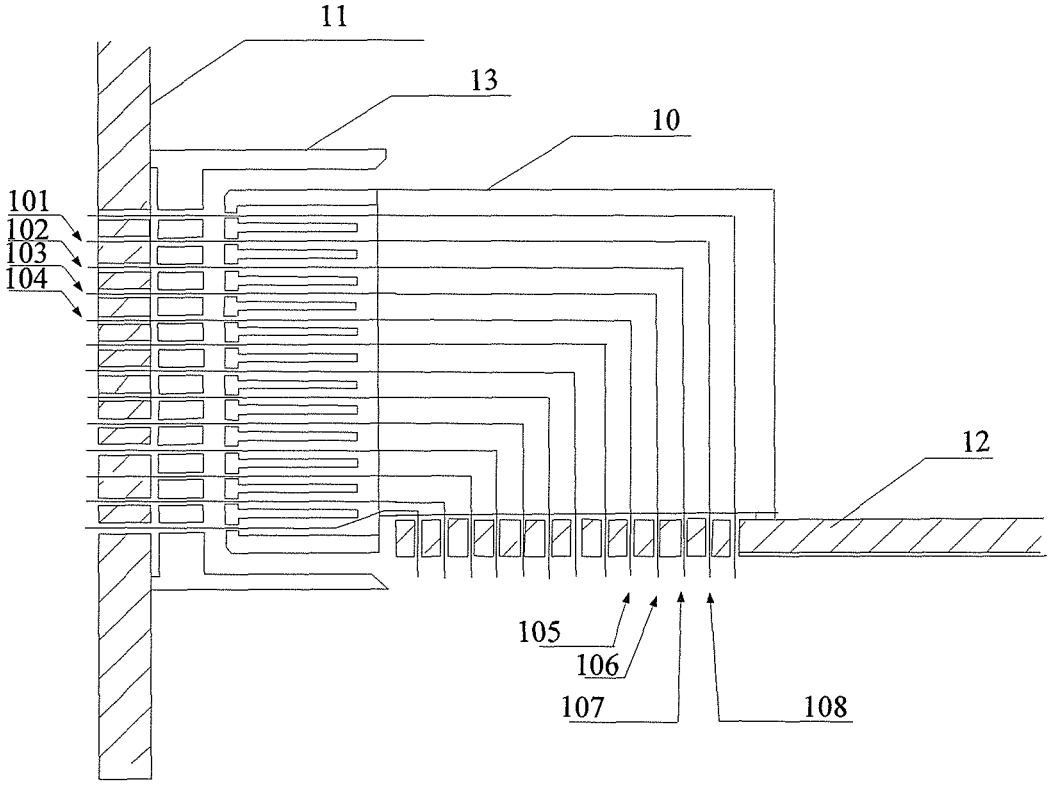


FIG. 2

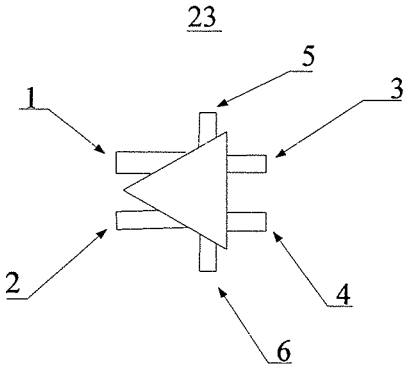


FIG. 3

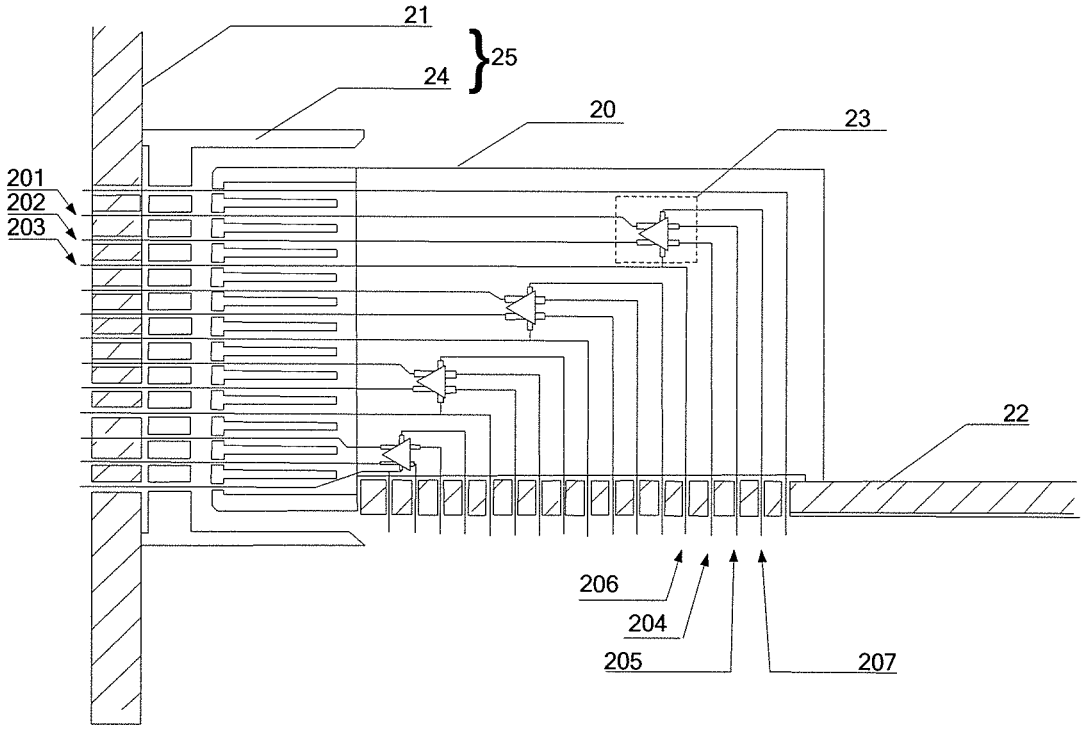


FIG. 4

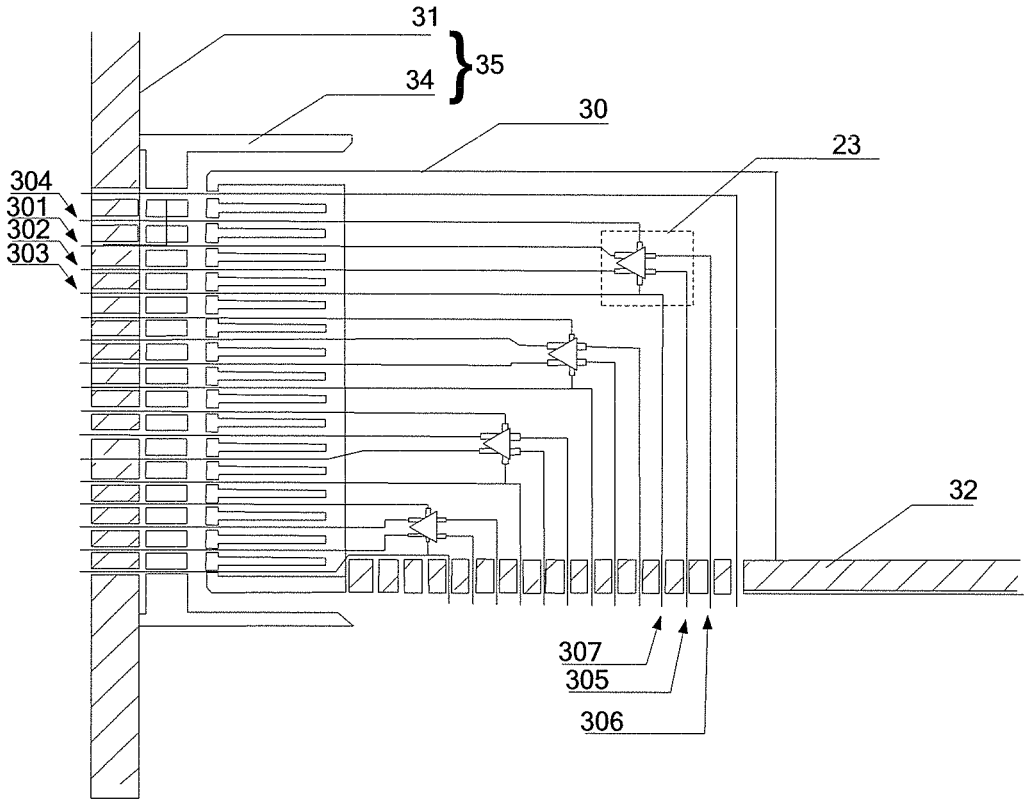

31
35
34
30
23
304
301
302
303
32
307
305
306

FIG. 5

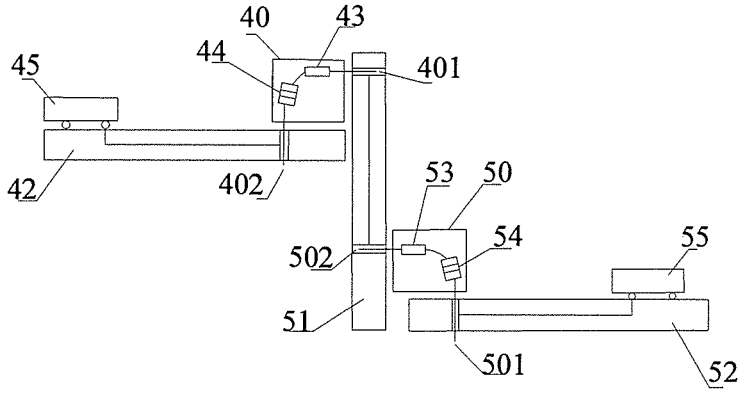

40
43
44
45
401
42
402
53
50
54
55
502
51
501
52

FIG. 6

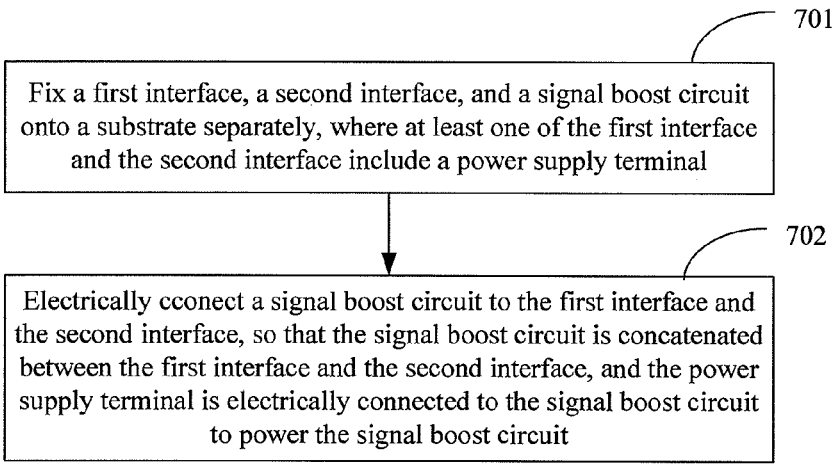


FIG. 7

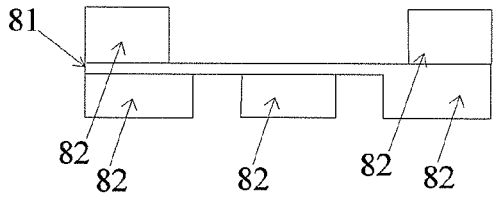


FIG. 8

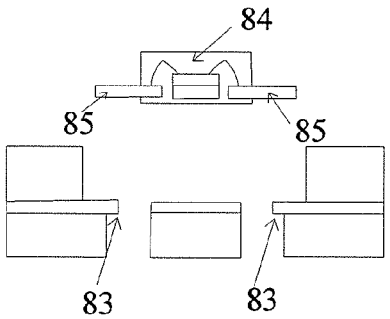


FIG. 9

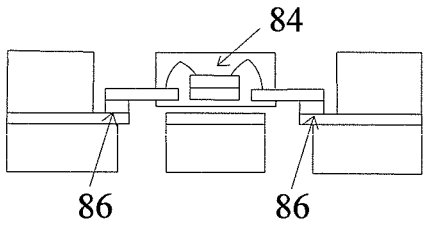


FIG. 10

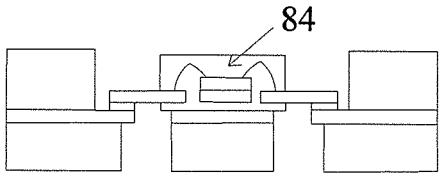


FIG. 11

608

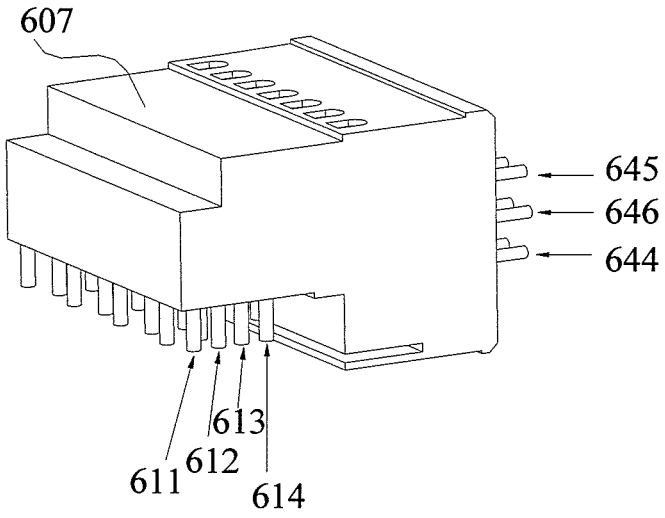


FIG. 12

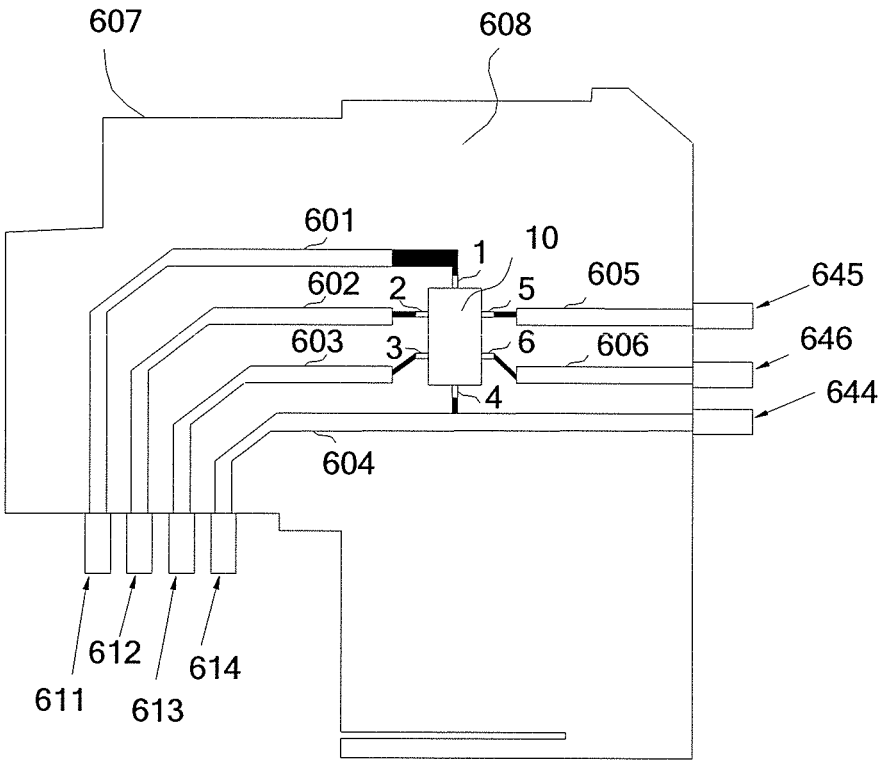

607
608
601
10
1
602
2
5
605
645
603
3
6
606
646
644
4
604
612
611
613
614

FIG. 13

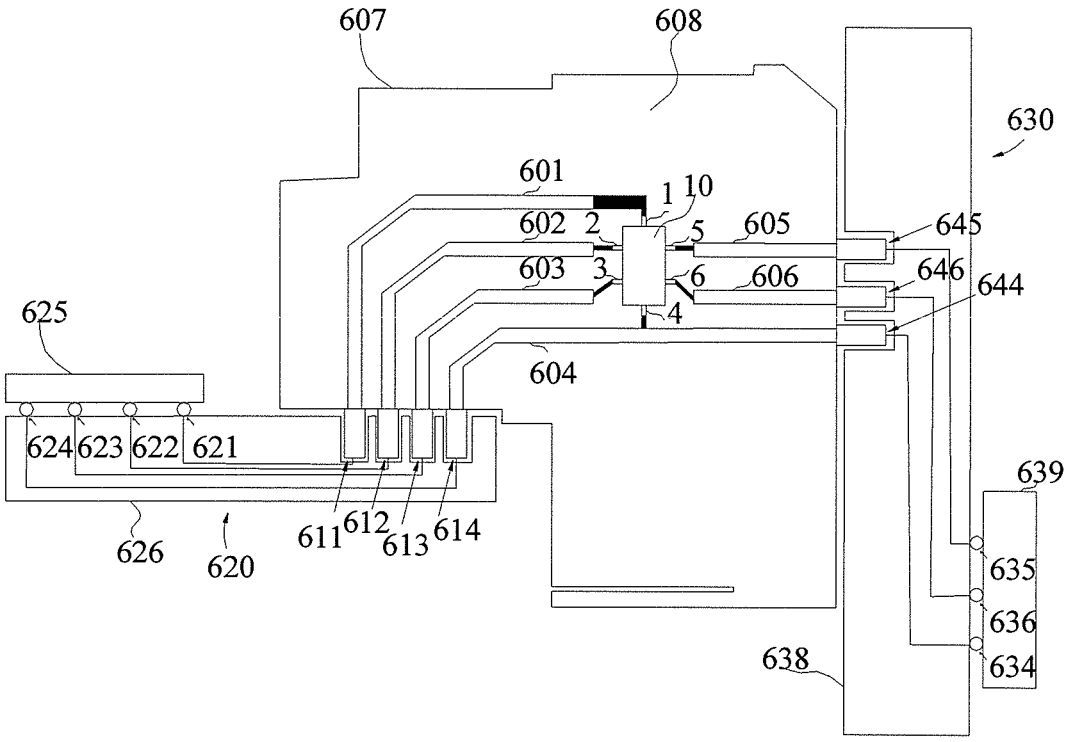

607
608
630
601
1
10
602
2
5
605
645
603
3
6
606
646
644
4
625
604
624
623
622
621
639
626
620
611
612
613
614
635
636
634
638

FIG. 14

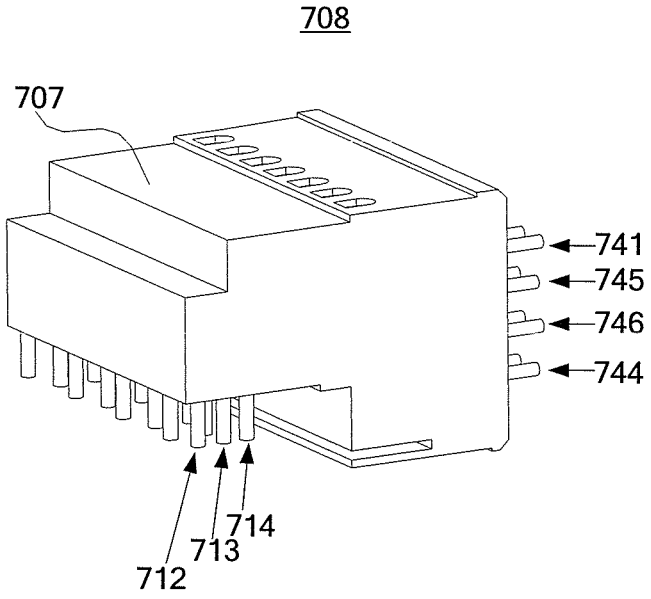

708
707
741
745
746
744
714
713
712

FIG. 15

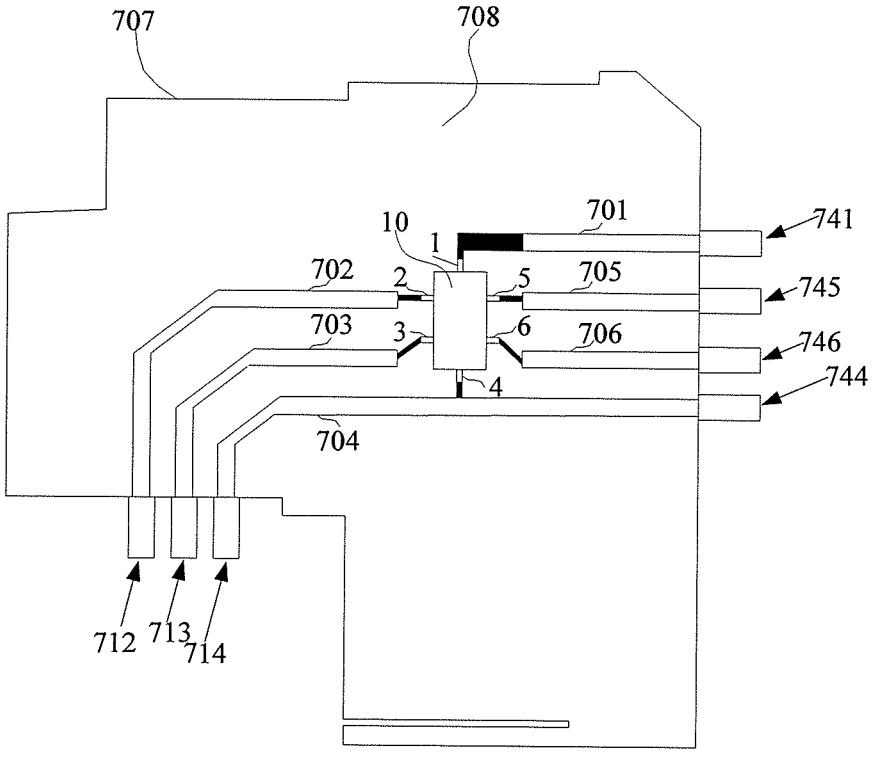

707
708
10
1
701
741
702
2
5
705
745
703
3
6
706
746
744
4
704
712
713
714

FIG. 16

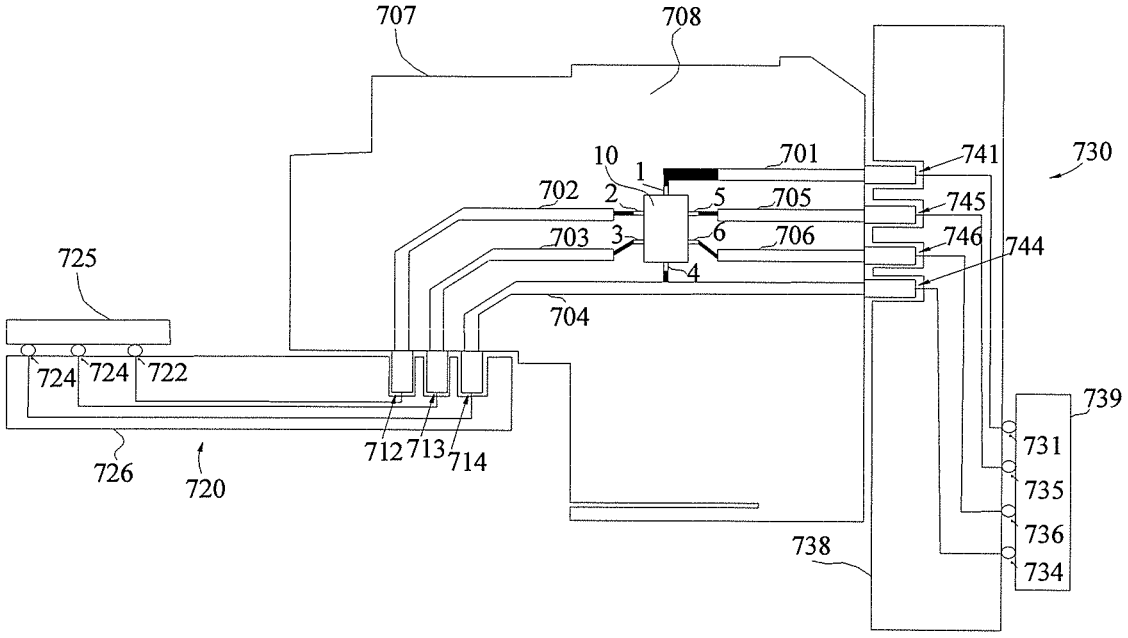

707
708
10
1
701
741
730
702
2
5
705
745
703
3
6
706
746
744
725
4
704
724
724
722
739
731
735
736
734
726
720
712
713
714
738

FIG. 17

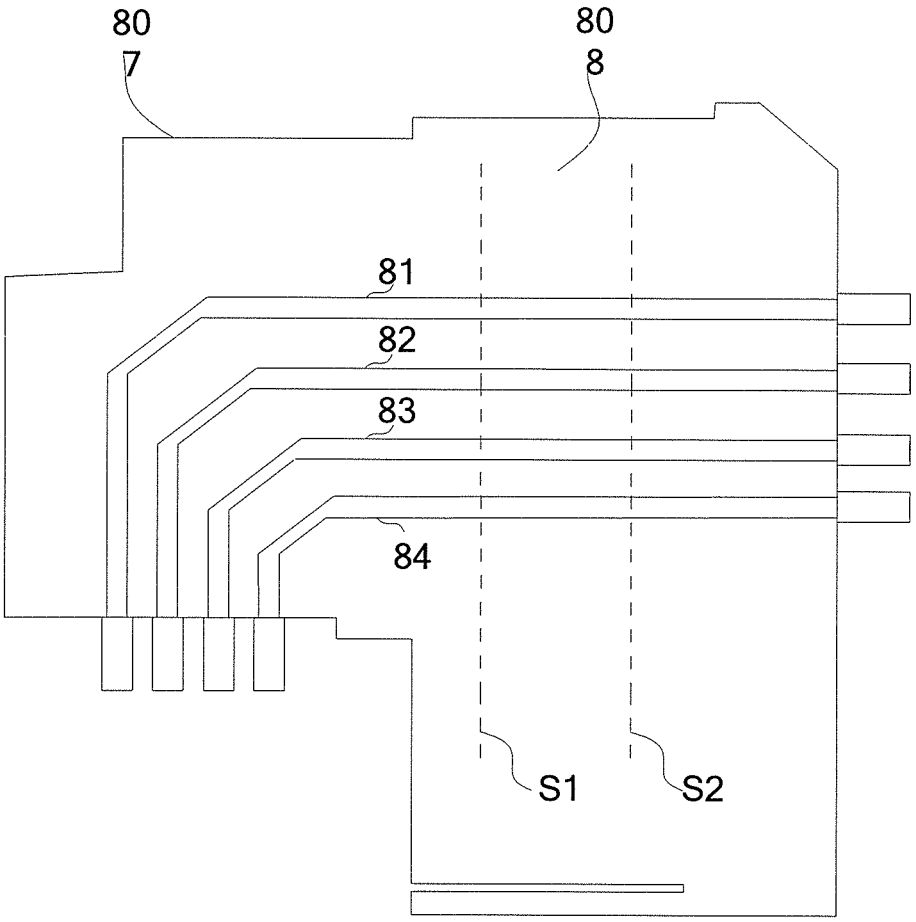


FIG. 18

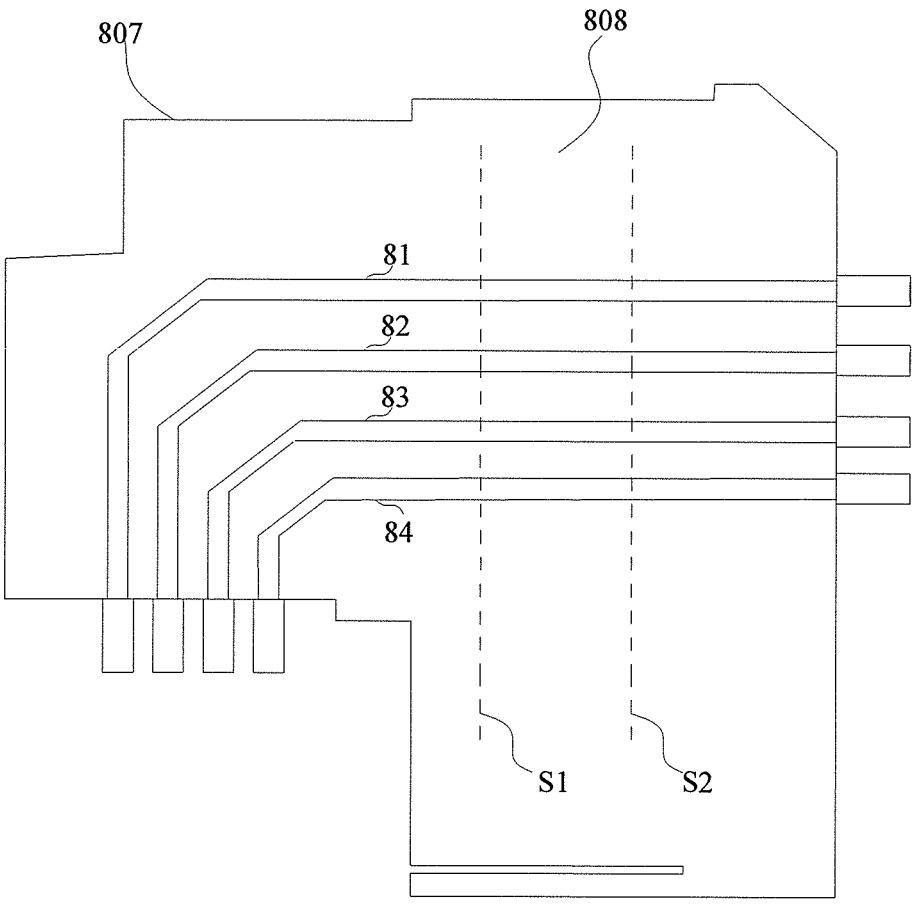


FIG. 19

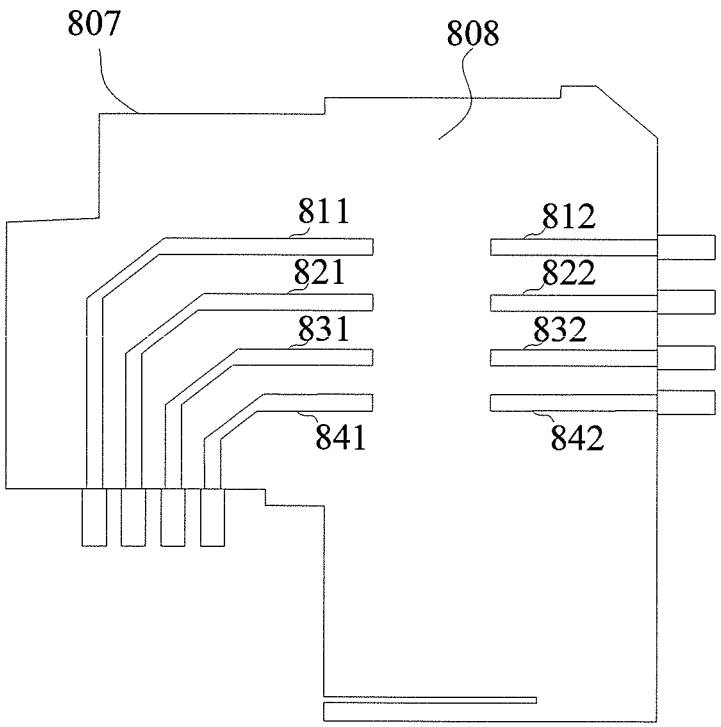


FIG. 20

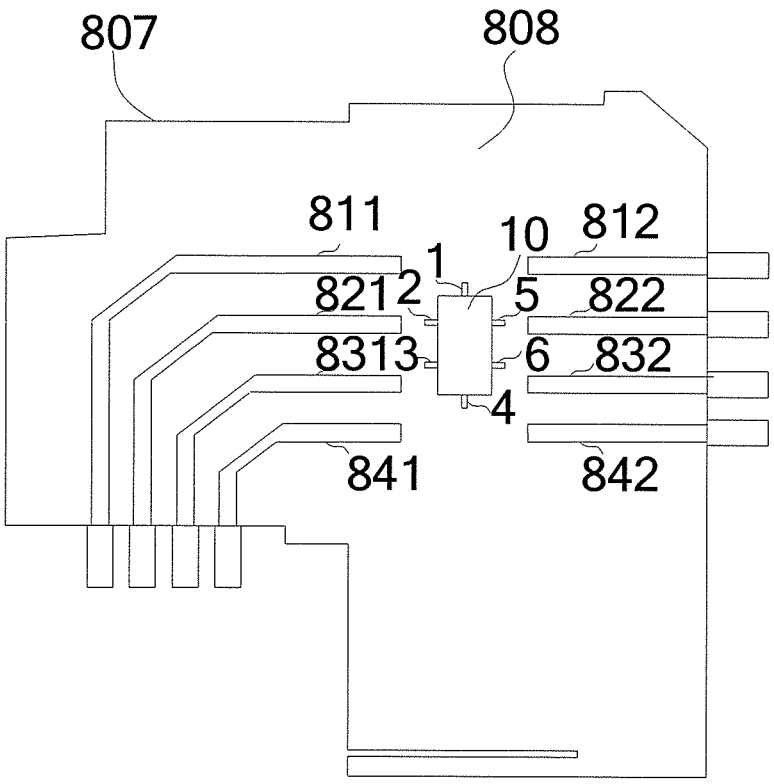


FIG. 21

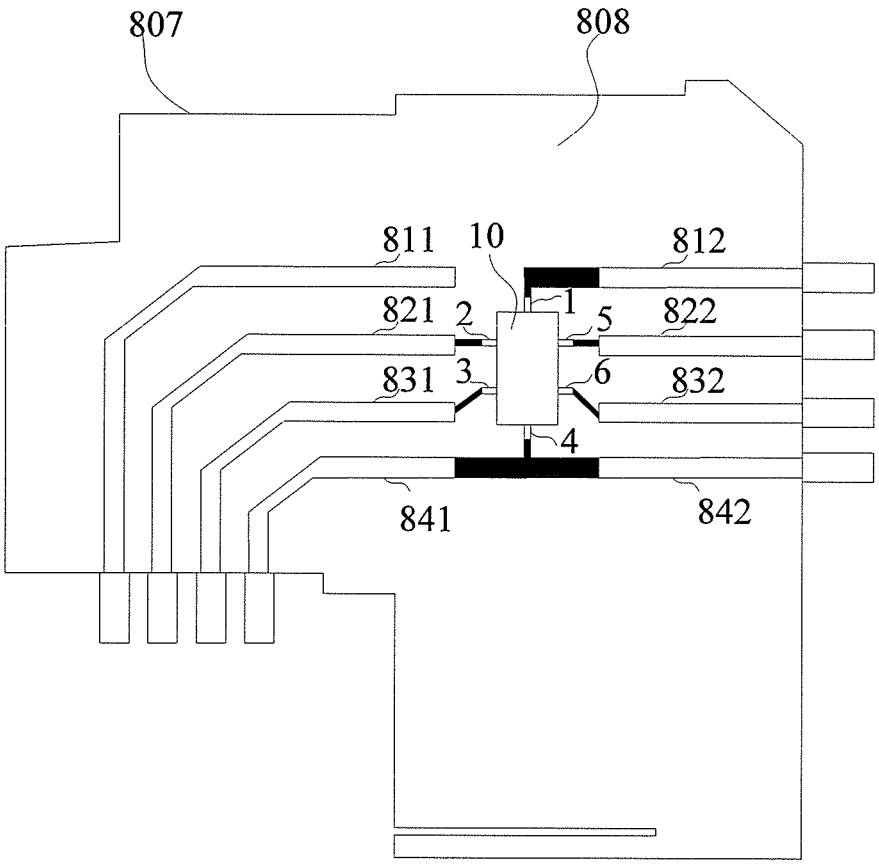


FIG. 22

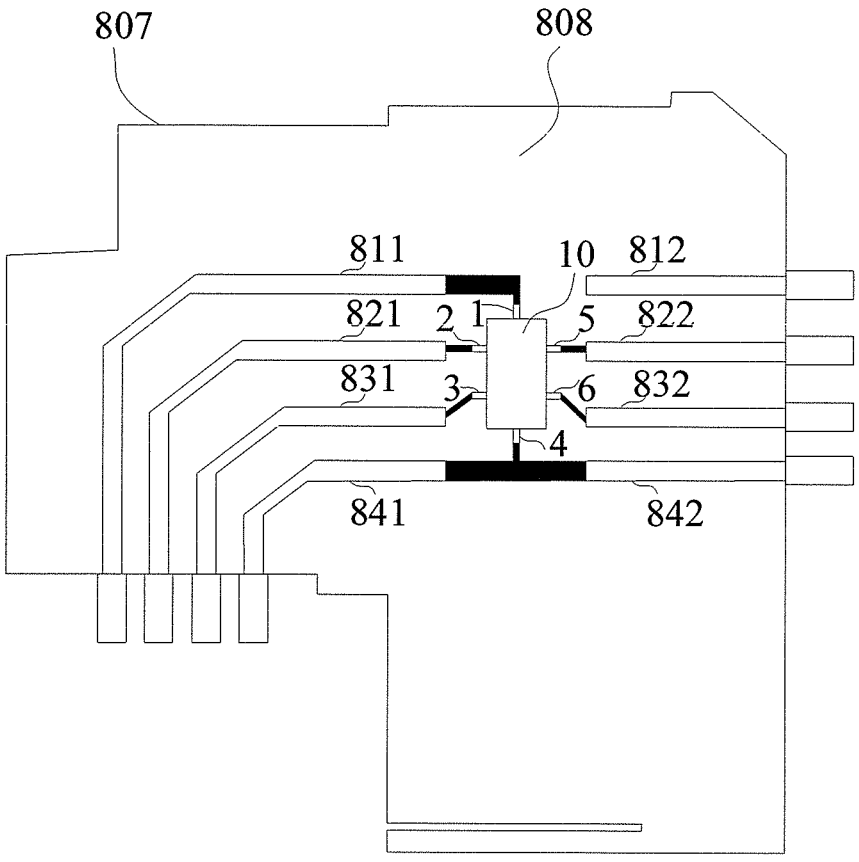


FIG. 23

CONNECTOR AND ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of International Application No. PCT/CN2013/074270, filed on Apr. 16, 2013, which claims priority to Chinese Patent Application No. 201210450492.5, filed on Nov. 12, 2012, both of which are hereby incorporated by reference in their entireties.

TECHNICAL FIELD

The present invention relates to the field of communications technologies, and in particular, to a connector and an electronic device.

BACKGROUND

Referring to FIG. **1**, FIG. **1** is a schematic structural diagram of using a connector to connect a backplane and a circuit board in an electronic device in the prior art. As illustrated in FIG. **1**, in the prior art, components forming a high-speed second circuit board link include a backplane **11**, a circuit board **12**, a circuit board **15**, a connector **10**, and a connector **14**. The connector **14** is used to connect the backplane **11** to the circuit board **15**, and the connector **10** is used to connect the backplane **11** to the circuit board **12**. A chip **16** is arranged on the circuit board **12**, a chip **13** is arranged on the circuit board **13**, and internal circuit connection wires (not illustrated in FIG. **1**) are arranged inside the backplane **11**, the circuit board **12**, the circuit board **15**, the connector **14**, and the connector **10**. The connector **14** is connected to the backplane **11** and the circuit board **15**. After the connector **10** is connected to the backplane **11** and the circuit board **12**, an electrical connection is implemented between the chip **16** and the chip **13**.

Referring to FIG. **2**, FIG. **2** is a detailed circuit diagram of connections between a connector and a second circuit board as well as the circuit board in the prior art. FIG. **2** further illustrates detailed circuit connection relationships between the connector **10** and the backplane **11** and the circuit board **12** that are illustrated in FIG. **1**. As illustrated in FIG. **2**, the connector **10** includes conductive contact heads **101**, **102**, **103**, and **104** (for clarity in FIG. **2**, only the 4 contact heads are given as examples, and the actual number of contact heads is illustrated in FIG. **2**), and conductive contact heads **105**, **106**, **107**, and **108** (for clarity in FIG. **2**, only the 4 contact heads are given as examples, and the actual number of contact heads is illustrated in FIG. **2**). The conductive contact heads **101**, **102**, **103**, and **104** are optionally pluggable into the backplane **11**, the conductive contact heads **105**, **106**, **107**, and **108** are optionally pluggable into the circuit board **12**, an internal electrical connection is implemented between the conductive contact head **101** and the conductive contact head **108** in the connector **10**, an internal electrical connection is implemented between the conductive contact head **102** and the conductive contact head **107** in the connector **10**, an internal electrical connection is implemented between the conductive contact head **103** and the conductive contact head **106** in the connector **10**, and an internal electrical connection is implemented between the conductive contact head **104** and the conductive contact head **105** in the connector **10**. Therefore, when the circuit board **12** is connected to the backplane **11** by using the connector **10**, a plurality of electrical connections

may be formed between the backplane **11** and the circuit board **12**, and data signals are transmitted over the plurality of electrical connections.

In the long-term research, the inventor of the present invention finds that the signal transmission speed of the high-speed second circuit board link is required to be higher and higher. For example, it will be increased from the current 10 Gbs to 17 Gbs gradually, and is predicted to be further increased from 17 Gbs to 25 Gbs. Under a high data transmission speed, signal attenuation will be higher and higher. Due to cabling loss restriction of traditional circuit boards, in order to implement a link with a speed of 25 Gbs, an M6 board material or a high-speed cable solution is required to control signal attenuation that occurs in the internal circuit connection wires. However, M6 board materials and high-speed cables are very expensive, increasing the costs. In addition, if high-speed cables are used instead of the foregoing connection manner, tens of thousands of lines on the second circuit board have to be replaced with cable connections. This extremely complicates the design solution.

Another solution in the prior art is to add a balancer on the circuit board **12** connected to the connector **10** to boost signal amplitude and control signal attenuation. However, due to the increasing integration of products, space on the circuit board **12** is scarce, and the balancer added on the circuit board **12** will increase the product size.

SUMMARY

The present invention aims to provide a connector and an electronic device to control signal attenuation under a high data transmission speed without leading to a size increase.

In one aspect, a connector is provided, including: a first interface, a second interface, and a signal boost circuit, where at least one of the first interface and the second interface includes a power supply contact head, and the power supply contact head is connected to an external power supply to power the signal boost circuit; and a casing, where the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, and the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing.

With reference to the implementation manner of the first aspect, in a first possible implementation manner, the first interface includes a first conductive contact head, a second conductive contact head, a third conductive contact head, and a fourth conductive contact head, where the first conductive contact head and the second conductive contact head are configured to receive a differential signal from outside of the casing, the third conductive contact head is configured to receive a ground signal from outside of the casing, and the fourth conductive contact head serves as the power supply contact head to receive a power supply from outside of the casing; the signal boost circuit includes a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, where the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, the power input terminal is connected to the fourth conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and

the second interface includes a fifth conductive contact head, a sixth conductive contact head, and a seventh conductive contact head, where the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal, and the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit.

With reference to the first aspect, in a second possible implementation manner, the first interface includes a first conductive contact head, a second conductive contact head, and a third conductive contact head, where the first conductive contact head and the second conductive contact head are configured to receive a differential signal from outside of the casing, and the third conductive contact head is configured to receive a ground signal from outside of the casing; the signal boost circuit includes a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, where the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and the second interface includes a fifth conductive contact head, a sixth conductive contact head, a seventh conductive contact head, and an eighth conductive contact head, where the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal, the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit, and the eighth conductive contact head is connected to a power input terminal as the power supply contact head, and is configured to receive a power supply from outside of the casing.

With reference to the first or second possible implementation manner of the first aspect, in a third possible implementation manner, a coupling capacitor is arranged between the fifth conductive contact head and the first output terminal, and between the sixth conductive contact head and the second output terminal, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

With reference to the first or second possible implementation manner of the first aspect, in a fourth possible implementation manner, the signal boost circuit is a balancer.

With reference to the first or second possible implementation manner of the first aspect, in a fifth possible implementation manner, a voltage value of the power supply is 1.8 V or 3.3 V.

A second aspect provides an electronic device, which includes a first circuit board, a second circuit board, and a connector, where the connector includes: a first interface, a second interface, and a signal boost circuit, where at least one of the first interface and the second interface includes a power supply contact head, and the power supply contact head contacts an external power supply to power the signal boost circuit; and a casing, where the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing; and a power output terminal is arranged on at least one of the first circuit board and the second circuit board, and the power supply contact head is connected to the power output terminal to acquire a power supply from the power output terminal to power the signal boost circuit.

With reference to the implementation manner of the second aspect, in a first possible implementation manner, the first interface includes a first conductive contact head, a second conductive contact head, a third conductive contact head, and a fourth conductive contact head, where the first conductive contact head and the second conductive contact head are configured to receive a differential signal from the first circuit board, the third conductive contact head is configured to receive a ground signal from the first circuit board, and the fourth conductive contact head serves as the power supply contact head to receive a power supply that is output from the power output terminal of the first circuit board; the signal boost circuit includes a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, where the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, the power input terminal is connected to the fourth conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and the second interface includes a fifth conductive contact head, a sixth conductive contact head, and a seventh conductive contact head, where the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal to receive a ground signal from the second circuit board, and the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit to the second circuit board.

With reference to the implementation manner of the second aspect, in a second possible implementation manner, the first interface includes a first conductive contact head, a second conductive contact head, and a third conductive contact head, where the first conductive contact head and the second conductive contact head are configured to receive a differential signal from the first circuit board, and the third conductive contact head is configured to receive a ground signal from the first circuit board; the signal boost circuit includes a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, where the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and the second interface includes a fifth conductive contact head, a sixth conductive contact head, a seventh conductive contact head, and an eighth conductive contact head, where the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal to receive a ground signal from

the second circuit board, the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit to the second circuit board, and the eighth conductive contact head serves as a power supply contact head to receive a power supply that is output from the power output terminal of the second circuit board.

With reference to the first or second possible implementation manner of the second aspect, in a third possible implementation manner, a coupling capacitor is arranged between the fifth conductive contact head and the first output terminal, and between the sixth conductive contact head and the second output terminal, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

With reference to the first or second possible implementation manner of the second aspect, in a fourth possible implementation manner, the signal boost circuit is a balancer.

With reference to the first or second possible implementation manner of the second aspect, in a fifth possible implementation manner, a voltage value of the power supply is 1.8 V or 3.3 V.

A third aspect provides a connector, including at least one conductor assembly, a casing, and a signal boost circuit, where the signal boost circuit is arranged inside the casing, the conductor assembly includes several conductors, and at least one conductor in the conductor assembly is connected to a power supply outside the casing and powers the signal boost circuit.

With reference to the implementation manner of the third aspect, in a first possible implementation manner, the conductor assembly includes four conductors, where one conductor powers the signal boost circuit, one conductor is connected to ground, two conductors transmit differential signals, and the signal boost circuit boosts the differential signals.

Different from the prior art, the connector and the electronic device in the embodiments of the present invention arrange a signal boost circuit in a casing of the connector to perform signal amplification processing on a differential signal. In this way, the connector is capable of controlling signal attenuation effectively under a high data transmission speed without increasing the size of a circuit board, and is capable of controlling costs of manufacturing and development effectively.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a schematic structural diagram of connections between a connector and a second circuit board as well as the circuit board in the prior art;

FIG. **2** is a detailed circuit diagram of connections between a connector and a second circuit board as well as the circuit board in the prior art;

FIG. **3** is a schematic structural diagram of a signal boost circuit in a connector according to a first embodiment of the present invention;

FIG. **4** is a detailed circuit diagram of connections between a connector and a second circuit board as well as the circuit board according to the first embodiment of the present invention;

FIG. **5** is a detailed circuit diagram of connections between a connector and a second circuit board as well as the circuit board according to a second embodiment of the present invention;

FIG. **6** is a schematic location diagram of a connector in a high-speed link according to a third embodiment of the present invention;

FIG. **7** is a flowchart of a connector manufacturing method according to a fourth embodiment of the present invention;

FIG. **8** is a schematic diagram of a cross section of a substrate;

FIG. **9** is a schematic diagram of a cross section of a substrate after the substrate is cut through;

FIG. **10** is a schematic diagram of a cross section of a substrate after solder paste and a signal boost circuit are placed at a fracture of the substrate;

FIG. **11** is a schematic diagram of a cross section of a connector according to the present invention;

FIG. **12** is a three-dimensional schematic structural diagram of a connector according to a fifth embodiment of the present invention;

FIG. **13** is a cross-sectional view of the connector according to the fifth embodiment of the present invention;

FIG. **14** is a schematic diagram of a system structure of an electronic device according to the fifth embodiment of the present invention;

FIG. **15** is a three-dimensional schematic structural diagram of a connector according to a sixth embodiment of the present invention;

FIG. **16** is a cross-sectional view of the connector according to the sixth embodiment of the present invention;

FIG. **17** is a schematic diagram of a system structure of an electronic device according to the six embodiment of the present invention;

FIG. **18** is a cross-sectional view of a connector without a signal boost circuit arranged according to a seventh embodiment of the present invention;

FIG. **19** is a schematic structural diagram of the connector illustrated in FIG. **18** when the connector is being cut according to the seventh embodiment of the present invention;

FIG. **20** is a schematic structural diagram of the connector illustrated in FIG. **18** after the connector is cut according to the seventh embodiment of the present invention;

FIG. **21** shows a location for placing a signal boost circuit after connectors are cut according to the seventh embodiment of the present invention;

FIG. **22** is a schematic structural diagram of a connector obtained after a first welding manner is implemented according to the seventh embodiment of the present invention; and

FIG. **23** is a schematic structural diagram of a connector obtained after another welding manner is implemented according to the seventh embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

An embodiment of the present invention provides a connector, including: a first interface, a second interface, and a signal boost circuit, where at least one of the first interface and the second interface includes a power supply contact head, and the power supply contact head contacts an external power supply to power the signal boost circuit; and a casing, where the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, and the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing.

Further, an embodiment of the present invention provides an electronic device, including a first circuit board, a second

circuit board, and a connector. The connector includes: a first interface, a second interface, and a signal boost circuit, where at least one of the first interface and the second interface includes a power supply contact head, and the power supply contact head is configured to power the signal boost circuit; and a casing, where the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, the first interface and the second interface are arranged on different surfaces outside the casing, a power output terminal is arranged on at least one of the first circuit board and the second circuit board, and the power supply contact head is connected to the power output terminal to acquire a power supply from the power output terminal to power the signal boost circuit.

Further, an embodiment of the present invention provides a connector, including at least one conductor assembly, a casing, and a signal boost circuit, where the signal boost circuit is arranged inside the casing, the conductor assembly includes several conductors, and at least one conductor in the conductor assembly is connected to a power supply outside the casing and powers the signal boost circuit.

In the manner described above, the connector and the electronic device in the embodiments of the present invention arrange a signal boost circuit in a casing of the connector, and are powered by a power supply outside the casing; and the signal boost circuit performs signal amplification processing on a differential signal. In this way, the connector is capable of controlling signal attenuation effectively under a high data transmission speed without increasing the size of the circuit board. In addition, by avoiding use of M6 board materials and high-speed cables, the present invention controls costs of manufacturing and development effectively.

The following describes the connector and the electronic device in the embodiments of the present invention with reference to specific embodiments.

Referring to FIG. **3**, FIG. **3** is a schematic structural diagram of a signal boost circuit in a connector according to a first embodiment of the present invention. The signal boost circuit **23** is configured to amplify a voltage of a signal to achieve a signal boost effect. It includes a first input terminal **1**, a second input terminal **2**, a first output terminal **3**, a second output terminal **4**, a ground terminal **6**, and a power input terminal **5**. An external power supply is input into the power input terminal **5** to power the signal boost circuit **23**. After the power supply is obtained, a data signal (in the present invention, a differential signal) input into the first input terminal **1** is output from the first output terminal **3** after experiencing signal amplification processing performed by the signal boost circuit **23**, and a data signal (in the present invention, another differential signal) input into the second input terminal **2** is output from the second output terminal **4** after experiencing signal amplification processing performed by the signal boost circuit **23**. It should be noted that the signal boost circuit **23** in the present invention applies the same amplification scale of the voltage amplitude to the two differential signals to ensure that the two differential signals have equal amplitudes and keep inverse phases.

The signal boost circuit **23** may be implemented as any circuit capable of amplifying a voltage amplitude or a balancer applied widely in the prior art. Usually, the balancer has been encapsulated as a chip. When the connector in the present invention is being manufactured, it is only required that a pin of the balancer is correspondingly welded to a line that requires signal relaying, which simplifies the manufacturing procedure. Therefore, the present invention preferably uses a balancer as the signal boost circuit.

Referring to FIG. **4**, FIG. **4** is a schematic structural diagram of a circuit of an electronic device according to the first embodiment of the present invention. As illustrated in FIG. **4**, this embodiment discloses an electronic device, which includes a first circuit board **25**, a second circuit board **22**, and a connector **20**.

The connector **30** includes a first interface (not illustrated), a second interface (not illustrated), a casing (not illustrated), and the signal boost circuit **23** illustrated in FIG. **3**. The signal boost circuit **23** is arranged in the casing. The first interface includes a first conductive contact head **204**, a second conductive contact head **205**, a third conductive contact head **206**, and a fourth conductive contact head **207**. The second interface includes a fifth conductive contact head **201**, a sixth conductive contact head **202**, and a seventh conductive contact head **203**. The signal boost circuit **23** is arranged inside the casing and concatenated between the first interface and the second interface. The first interface and the second interface are arranged on different surfaces outside the casing.

The first conductive contact head **204** and the second conductive contact head **205** are configured to receive a differential signal from outside of the casing (in this embodiment, the first circuit board **22**). The third conductive contact head **206** is configured to receive a ground signal from outside of the casing (in this embodiment, the first circuit board **22**). The fourth conductive contact head **207** serves as a power supply contact head to receive a power supply from outside of the casing (in this embodiment, the first circuit board **22**). The first input terminal **1** of the signal boost circuit **23** is connected to the first conductive contact head **204**, the second input terminal **2** is connected to the second conductive contact head **205**, the ground terminal **6** is connected to the third conductive contact head **206**, and the power input terminal **5** is connected to the fourth conductive contact head **207**.

The fifth conductive contact head **201** of the second interface is connected to the first output terminal **3**, the sixth conductive contact head **202** is connected to the second output terminal **4**, the seventh conductive contact head **203** is connected to the ground terminal **6**, and the fifth conductive contact head **201** and the sixth conductive contact head **202** output the differential signal experiencing signal amplification processing performed by the signal boost circuit **23**.

Specifically, in this embodiment, the power supply is provided by the first circuit board **22**. A power output terminal (not illustrated) is arranged on the first circuit board **22**. The power output terminal is connected to the fourth conductive contact head **207** serving as a power supply contact head, and is configured to supply power to the power input terminal **5**, so as to power the signal boost circuit **23**.

In this embodiment, the second circuit board **25** is preferably a backplane, and includes a main body **21** and a third interface **24**, where the third interface **24** is connected to the first interface in a pluggable manner. Its interface connection manner can be implemented by using various methods in the prior art and therefore is not detailed herein.

The signal boost circuit **23** is arranged in the connector **20**, and the power supply required by the signal boost circuit **23** is provided by the power output terminal of the first circuit board **22**. Therefore, the connector and the electronic device disclosed in this embodiment are capable of controlling signal attenuation effectively under a high data transmission speed without increasing the size of the circuit board **22**. This controls costs of manufacturing and development effectively.

In the first embodiment, for ease of description, only one signal boost circuit **23** is taken as an example in the descrip-

tion. However, as illustrated in FIG. **4**, the number of the signal boost circuits **23** may also be plural, the first interface may also include a contact head combination formed by a plurality of groups of the first conductive contact head **204**, the second conductive contact head **205**, the third conductive contact head **206**, and the fourth conductive contact head **207**, and the second interface may also include a contact head combination formed by a plurality of groups of the fifth conductive contact head **201**, the sixth conductive contact head **202**, and the seventh conductive contact head **203**, thereby implementing relay transmission of a plurality of pairs of differential signals.

It should be noted that in an alternative embodiment of the present invention, a coupling capacitor may be arranged between the fifth conductive contact head **201** of the connector **20** described in the first embodiment and the first output terminal **1** of the signal boost circuit **23**, and between the sixth conductive contact head **202** and the second output terminal **2** of the signal boost circuit **23**, so as to perform direct current blocking for the differential signal experiencing signal amplification processing and filter out direct current interference in the differential signal. A specific capacitance value of the coupling capacitor may be selected according to actual requirements, and is not specifically limited in the present invention.

Referring to FIG. **5**, FIG. **5** is a schematic structural diagram of a circuit of an electronic device according to a second embodiment of the present invention. As illustrated in FIG. **5**, this embodiment discloses an electronic device, which includes a first circuit board **35**, a second circuit board **32**, and a connector **30**.

The connector **30** includes a first interface (not illustrated), a second interface (not illustrated), a casing (not illustrated), and the signal boost circuit **23** illustrated in FIG. **3**. The signal boost circuit **23** is arranged in the casing. The first interface includes a first conductive contact head **305**, a second conductive contact head **306**, and a third conductive contact head **307**. The second interface includes a fifth conductive contact head **301**, a sixth conductive contact head **302**, a seventh conductive contact head **303**, and an eighth conductive contact head **304**. The signal boost circuit **23** is arranged inside the casing and concatenated between the first interface and the second interface. The first interface and the second interface are arranged on different surfaces outside the casing.

The first conductive contact head **305** and the second conductive contact head **306** are configured to receive a differential signal from outside of the casing (in this embodiment, the first circuit board **32**). The third conductive contact head **307** is configured to receive a ground signal from outside of the casing (in this embodiment, the first circuit board **32**). The first input terminal **1** is connected to the first conductive contact head **305**, the second input terminal **2** is connected to the second conductive contact head **306**, the ground terminal **6** is connected to the third conductive contact head **307**, and the signal boost circuit acquires the differential signal over the first input terminal **1** and the second input terminal **2**, and performs signal amplification processing. The fifth conductive contact head **301** is connected to the first output terminal **3**. The sixth conductive contact head **302** is connected to the second output terminal **4**. The seventh conductive contact head **303** is connected to the ground terminal **6**. The fifth conductive contact head **301** and the sixth conductive contact head **302** output the differential signal experiencing signal amplification processing performed by the signal boost circuit **23**. The eighth conductive contact head **304** is connected to the power input terminal **5** as a power supply contact head, and is configured to receive a power supply from outside of the casing (in this embodiment, the second circuit board **35**).

Specifically, in this embodiment, the differential signal is provided by the first circuit board **32**, and the power supply is provided by the second circuit board **35**. A power output terminal (not illustrated) is arranged on the second circuit board **35**. The power output terminal is connected to the fourth conductive contact head **304** serving as a power supply contact head, and is configured to supply power to the power input terminal **5**, so as to power the signal boost circuit **23**.

In this embodiment, the second circuit board **35** is preferably a backplane, and includes a main body **31** and a third interface **34**. The third interface **34** is connected to the first interface in a pluggable manner. Its interface connection manner can be implemented by using various methods in the prior art and therefore is not detailed herein.

The signal boost circuit **23** is arranged in the connector **30**, and the power supply required by the signal boost circuit **23** is provided by the power output terminal of the second circuit board **35**. Therefore, the connector and the electronic device disclosed in this embodiment are capable of controlling signal attenuation effectively under a high data transmission speed without increasing the size of the circuit board. This controls costs of manufacturing and development effectively.

It should be noted that in an alternative embodiment of the present invention, a coupling capacitor may be arranged between the fifth conductive contact head **301** of the connector **30** described in the second embodiment and the first output terminal **1** of the signal boost circuit **23**, and between the sixth conductive contact head **302** and the second output terminal **2** of the signal boost circuit **23**, so as to perform direct current blocking for the differential signal experiencing signal amplification processing and filter out direct current interference in the differential signal. A specific capacitance value of the coupling capacitor may be selected according to actual requirements, and is not specifically limited in the present invention.

In the second embodiment, for ease of description, only one signal boost circuit **23** is taken as an example in the description. However, as illustrated in FIG. **5**, the number of the signal boost circuits **23** may also be plural, the first interface may also include a contact head combination formed by a plurality of groups of the first conductive contact head **305**, the second conductive contact head **306**, the third conductive contact head **307**. The second interface may also include a contact head combination formed by a plurality of groups of the fifth conductive contact head **301**, the sixth conductive contact head **302**, the seventh conductive contact head **303**, and the eighth conductive contact head **304**, thereby implementing relay transmission of a plurality of differential signals.

In addition, in all embodiments of the present invention, a voltage value of the power supply is preferably 1.8 V or 3.3 V, and the selection of the voltage value depends on the type or model of the signal boost circuit in use.

Referring to FIG. **6**, FIG. **6** is a schematic location diagram of a connector in a high-speed link according to a third embodiment of the present invention. As illustrated in FIG. **6**, components forming a high-speed second circuit board link include a second circuit board **51**, a circuit board **42**, a circuit board **42**, a connector **50**, and a connector **40**. A signal boost circuit **43** and a coupling capacitor **44** are arranged in the connector **40**, and a signal boost circuit **53** and a coupling capacitor **54** are arranged in the connector **50**.

The first interface **501** of the connector **50** is inserted in the circuit board **52**. The second interface **502** is inserted in the circuit board **51** to connect the second circuit board **51** and the

circuit board **52**. The first interface **401** of the connector **40** is inserted in the second circuit board **51**. The second interface **402** is inserted in the circuit board **42** to connect the second circuit board **51** and the circuit board **42**. A chip **55** is arranged on the circuit board **52**, a chip **435** is arranged on the circuit board **42**, and internal circuit connection wires (not illustrated) are arranged inside the backplane **11**, the circuit board **12**, and the circuit board **15**. After the connector **50** is connected to the second circuit board **51** and the circuit board **52** and the connector **40** is connected to the second circuit board **51** and the circuit board **42**, an electrical connection is implemented between the chip **55** and the chip **435**.

It should be noted that the connector applied here is the connector described in the foregoing embodiment. For ease of description and for clarity of illustration, the specific conductive contact heads included in the first interface **401**, the second interface **402**, the first interface **501**, and the first interface **502** are not illustrated. The conductive contact heads of the interfaces are the same as those described in the foregoing embodiment, and are not repeated here any further.

Because a signal boost circuit **53** is arranged in the connector **50** and a signal boost circuit **43** is arranged in the connector **40**, differential signals transmitted between the chip **55** and the chip **435** may experience signal amplification processing performed by the signal boost circuit **53** and the signal boost circuit **43**, thereby implementing relay amplification and controlling power loss of a differential signal transmitted at a high speed.

Referring to FIG. **7**, FIG. **7** is a flowchart of a connector manufacturing method according to a fourth embodiment of the present invention. As illustrated in FIG. **7**, the connector manufacturing method of the present invention includes the following steps:

Step **701**: Fix a first interface, a second interface, and a signal boost circuit onto a substrate separately, where at least one of the first interface and the second interface includes a power supply contact head.

Step **702**: Electrically connect the signal boost circuit to the first interface and the second interface, so that the signal boost circuit is concatenated between the first interface and the second interface, and the power supply contact head is electrically connected to the signal boost circuit to power the signal boost circuit.

In an alternative embodiment of the present invention, the step of electrically connecting the signal boost circuit to the first interface and the second interface is specifically: performing reflow soldering to weld a first input terminal, a second input terminal, a ground terminal, and a power input terminal of the packaged signal boost circuit onto a first conductive contact head, a second conductive contact head, a third conductive contact head, and a fourth conductive contact head of the first interface respectively, so as to create electrical connections on a one-to-one basis; and performing reflow soldering to weld a first output terminal, a second output terminal, and the ground terminal of the packaged signal boost circuit onto a fifth conductive contact head, a sixth conductive contact head, and a seventh conductive contact head of the second interface respectively, so as to create electrical connections on a one-to-one basis, thereby forming the connector described in the first embodiment of the present invention.

In another alternative embodiment of the present invention, the step of connecting the signal boost circuit to the first interface and the second interface electrically is specifically: performing reflow soldering to weld a first input terminal, a second input terminal, and aground terminal of the packaged signal boost circuit onto a first conductive contact head, a second conductive contact head, and a third conductive contact head of the first interface respectively, so as to create electrical connections on a one-to-one basis; and performing reflow soldering to weld a first output terminal, a second output terminal, the ground terminal, and a power input terminal of the packaged signal boost circuit onto a fifth conductive contact head, a sixth conductive contact head, a seventh conductive contact head, and an eighth conductive contact head of the second interface respectively, so as to create electrical connections on a one-to-one basis, thereby forming the connector described in the second embodiment of the present invention.

Specifically, FIG. **8** to FIG. **10** are schematic diagrams of an actual application process of the connector manufacturing method according to the present invention.

FIG. **8** is a cross-sectional view of the substrate (the existing connector illustrated in FIG. **2**). The substrate includes a plastic portion **82** and a cabling portion **81**.

As illustrated in FIG. **9**, a relay-required line is selected on the cabling portion **81**, and the line is cut to form a fracture **83**; and a packaged signal boost circuit **84** is prepared, which includes a pin **85**.

As illustrated in FIG. **10**, solder paste **86** is placed at the fracture **83** of the line, and the pin **85** of the packaged signal boost circuit **84** is placed onto the solder paste **86**.

As illustrated in FIG. **11**, by using the solder paste **86**, reflow soldering is performed to fix the signal boost circuit **84** onto the substrate to form the connector disclosed in the present invention. The specific selection of the line is not repeated here any further, and reference may be made to the embodiment illustrated in FIG. **7** and the alternative embodiments thereof.

Referring to FIG. **12**, FIG. **12** is a three-dimensional schematic structural diagram of a connector according to a fifth embodiment of the present invention. As illustrated in FIG. **12**, in this embodiment, a connector **608** includes a casing **607** and a plurality of contact heads **611**, **612**, **613**, **614**, **644**, **645**, and **646** that are arranged outside the casing **607**, where the contact heads **611**, **612**, **613**, and **614** are arranged on a surface of the casing **607**, and the contact heads **644**, **645**, and **646** are arranged on another surface of the casing **607**.

Referring to FIG. **13**, FIG. **13** is a cross-sectional view of the connector according to the fifth embodiment of the present invention. As illustrated in FIG. **13**, a signal boost circuit **10** and a conductor assembly are further arranged inside the connector.

The conductor assembly includes a first conductor **601**, a second conductor **602**, a third conductor **603**, a fourth conductor **604**, a fifth conductor **605**, and a sixth conductor **606**. The first conductor **601** is connected to a power supply outside the casing **607** and powers the signal boost circuit **10**.

The signal boost circuit **10** has a power input terminal **1**, a first signal input terminal **2**, a second signal input terminal **3**, a ground terminal **4**, a first signal output terminal **5**, and a second signal output terminal **6** arranged.

One end of the first conductor **601** is connected to the power input terminal **1**, and inputs a power supply from outside of the casing **607** into the signal boost circuit **10** to power the signal boost circuit **10**. One end of the second conductor **602** is connected to the first signal input terminal **2**, one end of the third conductor **603** is connected to the second signal input terminal **3**, and the second conductor **602** and the third conductor **603** input a differential signal from outside of the casing **607** into the signal boost circuit **10**. The signal boost circuit **10** performs signal amplification processing on the differential signal, and outputs it to one end of the fifth conductor **605** and one end of the sixth conductor **606**. The

ground terminal **4** is connected between one end of the fourth conductor **604** and the other end of the fourth conductor **604**.

The other end of the first conductor **601**, the other end of the second conductor **602**, the other end of the third conductor **603**, and the other end of the fourth conductor **604** are respectively connected to a plurality of conductive contact heads **611**, **612**, **613**, and **614** that are arranged on one surface of the casing **607**. The other end of the fifth conductor **605**, the other end of the sixth conductor **606**, and the other end of the fourth conductor **604** are respectively connected to a plurality of conductive contact heads **645**, **646**, and **644** that are arranged on another surface of the casing.

The first conductor **601**, the second conductor **602**, the third conductor **603**, and the fourth conductor **604** are curved conductors, and the fifth conductor **605** and the sixth conductor **606** are straight conductors. It should be noted that in this embodiment, the foregoing settings are made to meet the requirement of a vertical angle between external circuit boards (which will be detailed later) connected to the connector **608**, but in an alternative embodiment of the present invention, the shapes of the conductors may be set according to actual needs, and are not specifically limited in the present invention.

Moreover, the first conductor **601**, the second conductor **602**, the third conductor **603**, the fourth conductor **604**, the fifth conductor **605**, and the sixth conductor **606** are connected to the power input terminal **1**, the first signal input terminal **2**, the second signal input terminal **3**, the ground terminal **4**, the first signal output terminal **5**, and the second signal output terminal **6** by using solder paste (illustrated by the black part in the drawing) to fix and keep the electrical connections.

It should be noted that in an alternative embodiment of the present invention, a coupling capacitor may be arranged on the fifth conductor **605** and the sixth conductor **606** each, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

Referring to FIG. **14**, FIG. **14** is a schematic diagram of a system structure of an electronic device according to the fifth embodiment of the present invention. As illustrated in FIG. **14**, this embodiment further discloses an electronic device, which includes a first circuit board **620**, a second circuit board **630**, and the connector **608** illustrated in FIG. **13**.

The first circuit board **620** includes a main board body **626** and a component **625**, where a power output terminal **621**, differential signal output terminals **622** and **623**, and a ground terminal **624** are arranged on the component **625**.

The second circuit board **630** includes a main board body **638** and a component **639**, where differential signal input terminals **635** and **636** and a ground terminal **634** are arranged on the component **639**.

The first circuit board **620** has interfaces (not illustrated) arranged for inserting contact heads **611**, **612**, **613**, and **614**, and the second circuit board **630** has interfaces (not illustrated) arranged for inserting contact heads **645**, **646**, and **644**.

When the contact heads **611**, **612**, **613**, and **614** are inserted into the interfaces on the first circuit board **620** and the contact heads **611**, **612**, **613**, and **614** are inserted into the interfaces on the second circuit board **630**, the power output terminal **621**, the differential signal output terminals **622** and **623**, and the ground terminal **624** are respectively connected to the power input terminal **1**, the first signal input terminal **2**, the second signal input terminal **3**, and the ground terminal **4** by using the conductors (not illustrated) in the main board body **626**, the first conductor **601**, the second conductor **602**, the third conductor **603**, and the fourth conductor **604**; the first signal output terminal **5**, the second signal output terminal **6**, and the ground terminal **4** are respectively connected to the differential signal input terminals **635** and **636** and the ground terminal **634** by using the fifth conductor **605**, the sixth conductor **606**, the fourth conductor **604**, and the conductors (not illustrated) in the main board body **638**.

The power output terminal **621** outputs a power supply to the signal boost circuit **10** to keep it working. The differential signal output terminals **622** and **623** output a differential signal to the signal boost circuit **10** for relay amplification, and the signal boost circuit **10** outputs the differential signal experiencing relay amplification to the differential signal input terminals **635** and **636**. Moreover, the ground terminal **624** of the component **625**, the ground **4** of the signal boost circuit **10**, and the ground terminal **634** of the component **639** keep connected, thereby ensuring the three to share the ground.

Therefore, by using the power supply provided by the first circuit board **620**, the connector **608** is capable of performing relay amplification on a differential signal transmitted by the first circuit board **620** to the second circuit board **630**, thereby suppressing signal attenuation effectively.

In addition, because the first conductor **601** is connected to the fifth conductor **605** by using the signal boost circuit **10**, the first conductor **601** and the fifth conductor **605** may be combined into one conductor.

Similarly, because the second conductor **602** is connected to the sixth conductor **606** by using the signal boost circuit **10**, the second conductor **602** and the sixth conductor **606** may be combined into one conductor.

Therefore, in this embodiment, the conductor assembly includes four conductors, where the first conductor powers the signal boost circuit, the fourth conductor **604** is grounded, the conductor formed by the first conductor **601** and the fifth conductor **605** as well as the conductor formed by the second conductor **602** and the sixth conductor **606** are configured to transmit differential signals, and then the differential signals are boosted by the signal boost circuit **10**.

In an extended embodiment of the present invention, a plurality of conductor assemblies may be set, and a signal boost circuit is arranged for each conductor assembly in the manner described above, so as to amplify a plurality of differential signals simultaneously.

Referring to FIG. **15**, FIG. **15** is a three-dimensional schematic structural diagram of a connector according to a sixth embodiment of the present invention. As illustrated in FIG. **15**, in this embodiment, a connector **708** includes a casing **707** and a plurality of contact heads **712**, **713**, **714**, **744**, **745**, and **746** that are arranged outside the casing **707**. The contact heads **712**, **713**, **714**, and **715** are arranged on a surface of the casing **707**, and the contact heads **741**, **744**, **745**, and **746** are arranged on another surface of the casing **707**.

Referring to FIG. **16**, FIG. **16** is a cross-sectional view of the connector according to the sixth embodiment of the present invention. As illustrated in FIG. **13**, a signal boost circuit **10** and a conductor assembly are further arranged inside the connector **708**. The conductor assembly includes a first conductor **701**, a second conductor **702**, a third conductor **703**, a fourth conductor **704**, a fifth conductor **705**, and a sixth conductor **706**. The first conductor **701** is connected to a power supply outside the casing **707** and powers the signal boost circuit **10**.

The signal boost circuit **10** has a power input terminal **1**, a first signal input terminal **2**, a second signal input terminal **3**, a ground terminal **4**, a first signal output terminal **5**, and a second signal output terminal **6** arranged.

One end of the first conductor **701** is connected to the power input terminal **1**, and inputs a power supply from

outside of the casing **707** into the signal boost circuit **10** to power the signal boost circuit **10**. One end of the second conductor **702** is connected to the first signal input terminal **2**, one end of the third conductor **703** is connected to the second signal input terminal **3**, and the second conductor **702** and the third conductor **703** input a differential signal from outside of the casing **707** into the signal boost circuit **10**. The signal boost circuit **10** performs signal amplification processing on the differential signal, and outputs it to one end of the fifth conductor **705** and one end of the sixth conductor **706**, and the ground terminal **4** is connected between one end of the fourth conductor **704** and the other end the fourth conductor **704**.

The other end of the second conductor **702**, the other end of the third conductor **703**, and the other end of the fourth conductor **704** are respectively connected to a plurality of conductive contact heads **712**, **713**, and **714** that are arranged on one surface of the casing **707**. The other end of the first conductor **701**, the other end of the fifth conductor **705**, the other end of the sixth conductor **706**, and the other end of the fourth conductor **704** are respectively connected to a plurality of conductive contact heads **741**, **745**, **747**, and **744** that are arranged on another surface of the casing.

The second conductor **702**, the third conductor **703**, and the fourth conductor **704** are curved conductors, and the first conductor **701**, the fifth conductor **705**, and the sixth conductor **706** are straight conductors. It should be noted that in this embodiment, the foregoing settings are made to meet the requirement of a vertical angle between external circuit boards (which will be detailed later) connected to the connector **708**, but in an alternative embodiment of the present invention, the shapes of the conductors may be set according to actual needs, and are not specifically limited in the present invention.

Moreover, the first conductor **701**, the second conductor **702**, the third conductor **703**, the fourth conductor **704**, the fifth conductor **705**, and the sixth conductor **706** are connected to the power input terminal **1**, the first signal input terminal **2**, the second signal input terminal **3**, the ground terminal **4**, the first signal output terminal **5**, and the second signal output terminal **7** by using solder paste (illustrated by the black part in the drawing) to fix and keep the electrical connections.

It should be noted that in an alternative embodiment of the present invention, a coupling capacitor may be arranged on the fifth conductor **705** and the sixth conductor **706** each, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

In addition, because the first conductor **701** is connected to the fifth conductor **705** by using the signal boost circuit **10**, the first conductor **701** and the fifth conductor **705** may be combined into one conductor.

Similarly, because the second conductor **702** is connected to the sixth conductor **706** by using the signal boost circuit **10**, the second conductor **702** and the sixth conductor **706** may be combined into one conductor.

Therefore, in this embodiment, the conductor assembly includes four conductors, where the first conductor powers the signal boost circuit, the fourth conductor **704** is grounded, the conductor formed by the first conductor **701** and the fifth conductor **705** as well as the conductor formed by the second conductor **702** and the sixth conductor **706** are configured to transmit differential signals, and then the differential signals are boosted by the signal boost circuit **10**.

In addition, in an extended embodiment of the present invention, a plurality of conductor assemblies may be set, and a signal boost circuit is arranged for each conductor assembly in the manner described above, so as to amplify a plurality of differential signals simultaneously.

Referring to FIG. **17**, FIG. **17** is a schematic diagram of a system structure of an electronic device according to the sixth embodiment of the present invention. As illustrated in FIG. **17**, this embodiment further discloses an electronic device, which includes a first circuit board **720**, a second circuit board **730**, and the connector **708** illustrated in FIG. **16**.

The first circuit board **720** includes a main board body **726** and a component **725**, where differential signal output terminals **722** and **723** and a ground terminal **724** are arranged on the component **725**.

The second circuit board **730** includes a main board body **738** and a component **739**, where a power output terminal **731**, differential signal input terminals **735** and **736**, and a ground terminal **734** are arranged on the component **739**.

The first circuit board **720** has interfaces (not illustrated) arranged for inserting contact heads **712**, **713**, and **714**, and the second circuit board **730** has interfaces (not illustrated) arranged for inserting contact heads **741**, **745**, **746**, and **744**.

When the contact heads **712**, **713**, and **714** are inserted into the interfaces on the first circuit board **720** and the contact heads **741**, **745**, **746**, and **744** are inserted into the interfaces on the second circuit board **730**, the differential signal output terminals **722** and **723** and the ground terminal **724** are respectively connected to the first signal input terminal **2**, the second signal input terminal **3**, and the ground terminal **4** by using the conductors (not illustrated) in the main board body **726**, the second conductor **702**, the third conductor **703**, and the fourth conductor **704**. The power input terminal **1**, the first signal output terminal **5**, the second signal output terminal **6**, and the ground terminal **4** are respectively connected to the power output terminal **739**, the differential signal input terminals **735** and **736**, and the ground terminal **734** by using the first conductor **701**, the fifth conductor **705**, the sixth conductor **706**, the fourth conductor **704**, and the conductors (not illustrated) in the main board body **738**.

The power output terminal **731** outputs a power supply to the signal boost circuit **10** to keep it working. The differential signal output terminals **722** and **723** output a differential signal to the signal boost circuit **10** for relay amplification, and the signal boost circuit **10** outputs the differential signal experiencing relay amplification to the differential signal input terminals **735** and **736**. Moreover, the ground terminal **724** of the component **725**, the ground **4** of the signal boost circuit **10**, and the ground terminal **734** of the component **739** keep connected, thereby ensuring the three to share the ground.

Therefore, by using the power supply provided by the second circuit board **730**, the connector **708** is capable of performing relay amplification on a differential signal transmitted by the first circuit board **720** to the second circuit board **730**, thereby suppressing signal attenuation effectively.

The following expounds a connector manufacturing method according to a seventh embodiment of the present invention with reference to FIG. **18** to FIG. **24**. Referring to FIG. **18** first, FIG. **18** is a cross-sectional view of a connector without a signal boost circuit arranged according to a seventh embodiment of the present invention. As illustrated in FIG. **18**, a connector **809** includes a casing **807** and conductors **801**, **802**, **803**, and **804**.

Referring to FIG. **19**, FIG. **19** is a schematic structural diagram of the connector illustrated in FIG. **18** when the connector is being cut according to the seventh embodiment of the present invention. As illustrated in FIG. **19**, the conductors **801**, **802**, **803**, and **804** may be cut along the cutting lines S1 and S2 after the casing **807** is removed (if the casing

807 encloses the conductor incompletely, parts of the conductors exposed outside the casing 807 may be cut without removing the casing 807).

Referring to FIG. 20, FIG. 20 is a schematic structural diagram of the connector illustrated in FIG. 18 after the connector is cut according to the seventh embodiment of the present invention. As illustrated in FIG. 20, after the cutting, cut connectors 811, 812, 821, 822, 831, 832, 841, and 842 are formed.

Referring to FIG. 21, FIG. 21 shows a location for placing a signal boost circuit after conductors are cut according to the seventh embodiment of the present invention. As illustrated in FIG. 21, the signal boost circuit 10 is placed between fractures. The signal boost circuit 10 has a power input terminal 1, a first signal input terminal 2, a second signal input terminal 3, a ground terminal 4, a first signal output terminal 5, and a second signal output terminal 6 arranged.

Referring to FIG. 22, FIG. 22 is a schematic structural diagram of a connector obtained after a first welding manner is implemented according to the seventh embodiment of the present invention. As illustrated in FIG. 22, the power input terminal 1 is welded to the conductor 812, the first signal input terminal 2 is welded to the conductor 821, the second signal input terminal 3 is welded to the conductor 831, the ground terminal 4 is welded to the conductor 841 and the conductor 842 separately, the first signal output terminal 5 is welded to the conductor 822, the second signal output terminal 6 is welded to the conductor 832, and the conductor 811 is deleted, so as to obtain the connector described in the sixth embodiment (the conductor 811 may also be retained and connected to another signal boost circuit).

Referring to FIG. 23, FIG. 23 is a schematic structural diagram of a connector obtained after another welding manner is implemented according to the seventh embodiment of the present invention. As illustrated in FIG. 23, the power input terminal 1 is welded to the conductor 811, the first signal input terminal 2 is welded to the conductor 821, the second signal input terminal 3 is welded to the conductor 831, the ground terminal 4 is welded to the conductor 841 and the conductor 842 separately, the first signal output terminal 5 is welded to the conductor 822, the second signal output terminal 6 is welded to the conductor 832, and the conductor 812 is deleted, so as to obtain the connector described in the six embodiment (the conductor 812 may also be retained and connected to another signal boost circuit).

Therefore, the present invention discloses a connector, a method for manufacturing the connector, and an electronic device, which can perform signal amplification processing on a differential signal. In this way, the connector is capable of controlling signal attenuation effectively under a high data transmission speed without increasing the size of a circuit board, and is capable of controlling costs of manufacturing and development effectively.

The foregoing descriptions are merely embodiments of the present invention, and the protection scope of the present invention is not limited thereto. All equivalent structural or process changes made according to the content of this specification and accompanying drawings in the present invention or by directly or indirectly applying the present invention in other relevant technical fields shall fall within the protection scope of the present invention.

What is claimed is:

1. A connector, comprising:

a first interface, a second interface, and a signal boost circuit, wherein at least one of the first interface and the second interface comprises a power supply contact head configured to connect to a power supply outside the connector to power the signal boost circuit; and

a casing, wherein the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing.

2. A connector, comprising:

a first interface, a second interface, and a signal boost circuit, wherein at least one of the first interface and the second interface comprises a power supply contact head configured to connect to a power supply outside the connector to power the signal boost circuit;

a casing, wherein the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing;

the first interface comprises a first conductive contact head, a second conductive contact head, a third conductive contact head, and a fourth conductive contact head, wherein the first conductive contact head and the second conductive contact head are configured to receive the differential signal from outside of the casing, the third conductive contact head is configured to receive a ground signal from outside of the casing, and the fourth conductive contact head serves as the power supply contact head to receive a power supply from outside of the casing;

the signal boost circuit comprises a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, wherein the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, the power input terminal is connected to the fourth conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and

the second interface comprises a fifth conductive contact head, a sixth conductive contact head, and a seventh conductive contact head, wherein the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal, and the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit.

3. The connector according to claim 2, wherein a coupling capacitor is arranged between the fifth conductive contact head and the first output terminal, and between the sixth conductive contact head and the second output terminal, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

4. The connector according to claim 2, wherein a voltage value of the power supply is 1.8 V or 3.3 V.

5. A connector, comprising:

a first interface, a second interface, and a signal boost circuit, wherein at least one of the first interface and the second interface comprises a power supply contact head configured to connect to a power supply outside the connector to power the signal boost circuit;

a casing, wherein the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing;

the first interface comprises a first conductive contact head, a second conductive contact head, and a third conductive contact head, wherein the first conductive contact head and the second conductive contact head are configured to receive the differential signal from outside of the casing, and the third conductive contact head is configured to receive a ground signal from outside of the casing;

the signal boost circuit comprises a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, wherein the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and

the second interface comprises a fifth conductive contact head, a sixth conductive contact head, a seventh conductive contact head, and an eighth conductive contact head, wherein the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal, the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit, and the eighth conductive contact head is connected to the power input terminal as the power supply contact head, and is configured to receive the power supply from outside of the casing.

6. The connector according to claim 5, wherein a coupling capacitor is arranged between the fifth conductive contact head and the first output terminal, and between the sixth conductive contact head and the second output terminal, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

7. The connector according to claim 5, wherein a voltage value of the power supply is 1.8 V or 3.3 V.

8. An electronic device, comprising a first circuit board, a second circuit board, and a connector, wherein the connector comprises:

a first interface, a second interface, and a signal boost circuit, wherein at least one of the first interface and the second interface comprises a power supply contact head, and the power supply contact head is configured to connect to a power supply outside the connector to power the signal boost circuit; and

a casing, wherein the signal boost circuit is arranged inside the casing and concatenated between the first interface and the second interface, the signal boost circuit performs signal amplification processing on a differential signal received by the first interface and outputs the signal over the second interface, and the first interface and the second interface are arranged on different surfaces outside the casing; and

a power output terminal is arranged on at least one of the first circuit board and the second circuit board, and the power supply contact head is connected to the power output terminal to acquire a power supply from the power output terminal to power the signal boost circuit.

9. The electronic device according to claim 8, wherein:

the first interface comprises a first conductive contact head, a second conductive contact head, a third conductive contact head, and a fourth conductive contact head, wherein the first conductive contact head and the second conductive contact head are configured to receive the differential signal from the first circuit board, the third conductive contact head is configured to receive a ground signal from the first circuit board, and the fourth conductive contact head serves as the power supply contact head to receive a power supply that is output by the power output terminal of the first circuit board;

the signal boost circuit comprises a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input terminal, wherein the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, the power input terminal is connected to the fourth conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and

the second interface comprises a fifth conductive contact head, a sixth conductive contact head, and a seventh conductive contact head, wherein the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal and receives a ground signal from the second circuit board, and the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit to the second circuit board.

10. The electronic device according to claim 9, wherein a coupling capacitor is arranged between the fifth conductive contact head and the first output terminal, and between the sixth conductive contact head and the second output terminal, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

11. The electronic device according to claim 9, wherein a voltage value of the power supply is 1.8 V or 3.3 V.

12. The electronic device according to claim 8, wherein:

the first interface comprises a first conductive contact head, a second conductive contact head, a third conductive contact head, wherein the first conductive contact head and the second conductive contact head are configured to receive the differential signal from the first circuit board, and the third conductive contact head is configured to receive a ground signal from the first circuit board;

the signal boost circuit comprises a first input terminal, a second input terminal, a first output terminal, a second output terminal, a ground terminal, and a power input

terminal, wherein the first input terminal is connected to the first conductive contact head, the second input terminal is connected to the second conductive contact head, the ground terminal is connected to the third conductive contact head, and the signal boost circuit acquires the differential signal over the first input terminal and the second input terminal and performs signal amplification processing; and

the second interface comprises a fifth conductive contact head, a sixth conductive contact head, a seventh conductive contact head, and an eighth conductive contact head, wherein the fifth conductive contact head is connected to the first output terminal, the sixth conductive contact head is connected to the second output terminal, the seventh conductive contact head is connected to the ground terminal and receives a ground signal from the second circuit board, the fifth conductive contact head and the sixth conductive contact head output the differential signal experiencing signal amplification processing performed by the signal boost circuit to the second circuit board, and the eighth conductive contact head serves as the power supply contact head to receive the power supply that is output by the power output terminal of the second circuit board.

13. The electronic device according to claim **12**, wherein a coupling capacitor is arranged between the fifth conductive contact head and the first output terminal, and between the sixth conductive contact head and the second output terminal, so as to perform direct-current blocking for the differential signal experiencing signal amplification processing.

14. The electronic device according to claim **12**, wherein a voltage value of the power supply is 1.8 V or 3.3 V.

15. A connector, comprising at least one conductor assembly, a casing, and a signal boost circuit, wherein the signal boost circuit is arranged inside the casing, the conductor assembly comprises several conductors, and at least one conductor in the conductor assembly is connected to a power supply outside the casing and powers the signal boost circuit wherein the signal boost circuit comprises,

a first input terminal and a second input terminal configured to receive an input differential signal,

a first output terminal and a second output terminal configured to output an output processed differential signal generated from the input differential signal, and

a ground terminal and a power input terminal configured to provide power to the signal boost circuit.

16. The connector according to claim **15**, wherein the conductor assembly comprises four conductors, one conductor powers the signal boost circuit, one conductor is connected to ground, two conductors transmit differential signals, and the signal boost circuit boosts the differential signals.

* * * * *